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Microworms swallow the nanobait: The use of nanocoated microbial cells for the direct delivery of nanoparticles into Caenorhabditis elegans

Däwlätşina G., Minullina R., Fakhrullin R.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

The application of in vivo models in assessing the toxicity of nanomaterials is currently regarded as a promising way to investigate the effects of nanomaterials on living organisms. In this paper we introduce a novel method to deliver nanomaterials into Caenorhabditis elegans nematodes. Our approach is based on using nanoparticle-coated microbial cells as "nanobait", which are ingested by nematodes as a sole food source. We found that nematodes feed on the nanocoated bacteria (Escherichia coli) and microalgae (Chlorella pyrenoidosa) ingesting them via pharyngeal pumping, which results in localization of nanoparticles inside the digestive tract of the worms. Nanoparticles were detected exclusively inside the intestine, indicating the efficient delivery based on microbial cells. Delivery of iron oxide nanoparticles results in magnetic labelling of living nematodes, rendering them magnetically-responsive. The use of cell-mediated delivery of nanoparticles can be applied to investigate the toxicity of polymer-coated magnetic nanoparticles and citrate-capped silver nanoparticles in Caenorhabditis elegans in vivo.

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